INSTRUCTION 0019-9166

COMBINED SERVICE MANUAL for:
DIOXOR® II
MONOXOR® II
MONOXOR® II H (High Range)
NONOXOR® II

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1.0 SERVICE MANUAL CONTENTS

This manual contains the following service information for the . . .

DIOXOR II (Part No. 0019-7038 & 0019-7043)

MONOXOR II (Part No. 0019-7034 & 0019-7039)

MONOXOR II H (Part No. 0019-8015)

NONOXOR II (Part No. 0019-7036 & 0019-7042).

NOTE: *The 0019-7039, 0019-7042, and 0019-7043 versions of these instruments do not contain a probe, all non-probe related functions remain the same in this instruction.*

- Instrument maintenance, which includes information on how to:
  - Open and close the case
  - Clean the Fan Assembly and chamber assembly area
  - Replace the sensor
  - Replace the Printed Circuit Board (P.C.B.)
  - Service the gas-sensing chamber assembly (chamber assembly)
- Sensor calibration
- Troubleshooting chart
- Replacement parts list

GENERAL NOTE

If excessive torque is applied to the instrument's fasteners, poor performance or damage to components may occur.

The torque specifications are as follows:

Screws	Torque
Sensor Mounting	**4 - 8 oz. in.**
Motor Mounting	**6-10 oz. in.**
Chamber Sealing	**16-20 oz. in.**
Rear Cover/Case	**18-24 oz. in.**
Fan Assembly	**32-40 oz. in.**

2.0 MAINTENANCE

2.1 Opening the Case

Equipment Needed:

- Phillips-head screwdriver, No. 1

Procedure:

1. Lay the instrument face down on a workbench; then detach the metal clip from the bottom of case and fold the elastic strap over top of the instrument (Fig 2-1).

2. Slide off battery cover.

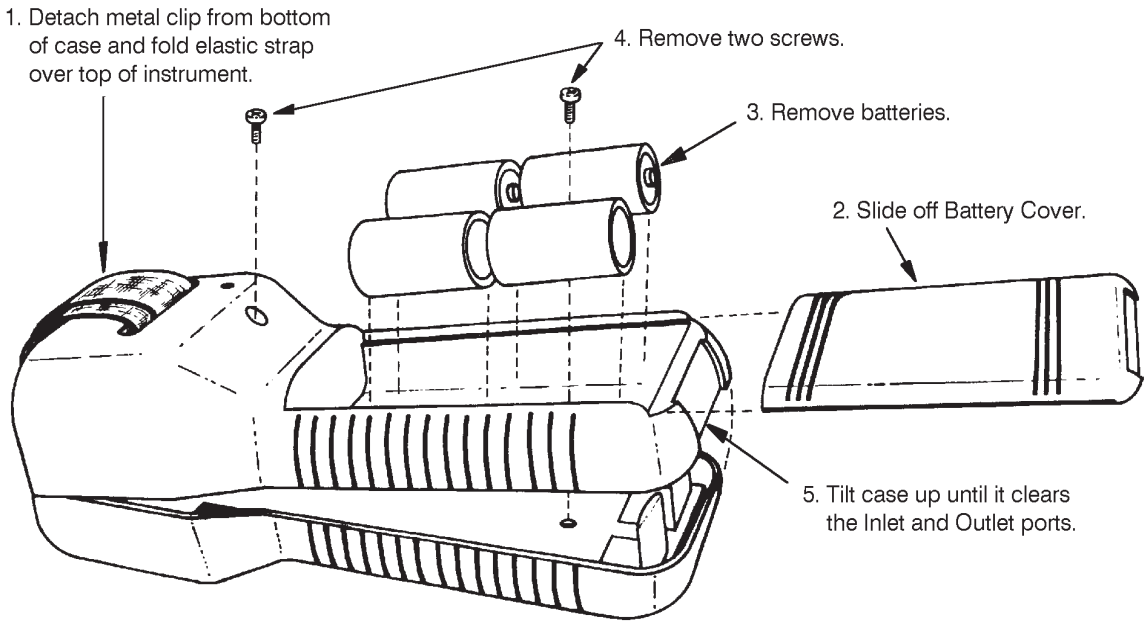
3. Remove batteries.

4. Using a No. 1 Phillips-head screwdriver, remove the two screws from the rear of the case.

5. Lift up the bottom portion of the rear case and slide it forward until the case clears the inlet port.

6. To gain better access to the components, remove the gas-sensing chamber assembly (Chamber Assembly) and the Printed Circuit Board (P.C.B.) from the front case by pulling them straight up from the front case (Fig 2-2); then lay these items on your workbench.

Figure 2-1.
Opening and Closing the Case



2.2 Closing the Case

Equipment Needed:

- Phillips-Head Screwdriver, No. 1

Procedure:

CAUTION

When replacing the P.C.B. and chamber assembly, the P.C.B. must be installed FIRST. The P.C.B. switches could be damaged if the P.C.B. is installed after the chamber assembly is in place.

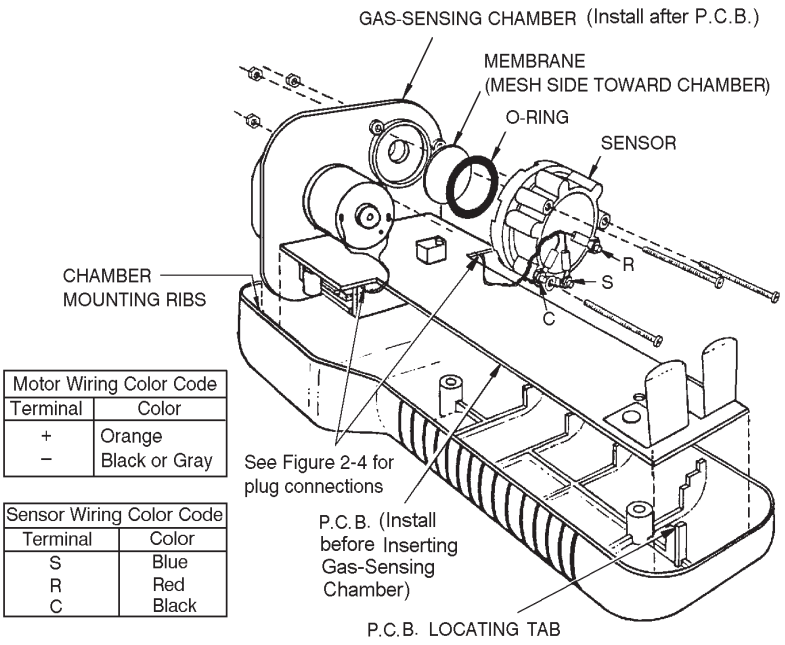
1. Ensure that the P.C.B. is properly positioned face down over its locating-tab on the front case (Fig 2-2).

2. Properly position the chamber assembly between the ribs of the front case.

3. Slide the rear case over the inlet port and properly join the two case halves together.

4. Secure the case halves to each other using the two screws removed in Section 2.1, Step 4 (Tighten to 18–24 oz. in.).

5. Reinstall the batteries (observe proper battery polarity); replace the battery cover; and attach the elastic strap's metal clip to the bottom of the instrument.



Motor Wiring Color Code	
Terminal	Color
+	Orange
–	Black or Gray

Sensor Wiring Color Code	
Terminal	Color
S	Blue
R	Red
C	Black

Figure 2-2. *P.C.B. and Chamber Assembly Removal and Installation*

2.3 Cleaning

The inside of the chamber assembly is the only part of the instrument that needs to be cleaned. To clean the chamber assembly, proceed as follows:

Equipment Needed:

- Screwdriver, No. 1 Phillips head
- Screwdriver, 1/8" flat-blade
- Warm soapy water
- Allen Wrench, .05 in.
- Clean rags
- Cotton Swabs
- Pipe cleaners

Procedure:

1. Open the case as described in Section "2.1 Opening the Case."

2. Using a flat-blade screwdriver, remove the three screws and nuts that secure the Sensor to the chamber assembly; DO NOT remove the sensor wires. Then remove the Sensor along with its O-ring and Membrane from the chamber assembly.

3. Using a No. 1 Phillips-head screwdriver, disassemble the chamber assembly by removing the two screws and nuts that secure the Chamber to the Motor Assembly
(Fig 2-3).

   NOTE: *Do not remove the Fan Assembly unless it's absolutely necessary for cleaning or repair purposes.*

4. If it is necessary to remove the Fan Assembly, first loosen the set screw on the Fan Assembly with the .05 in. Allen wrench, and then pull off the assembly.

   NOTE: *It is not necessary to disassemble the Motor Assembly. If motor replacement is required, refer to Section 2.6, Step 5.*

5. Clean the Fan Assembly, Chamber & Motor Assembly (see Fig 2-3) using cotton swabs and clean rags dampened with warm, soapy water. After cleaning, dry all parts with clean dry rags and cotton swabs.

   NOTE: *Replace, DO NOT CLEAN, the Membrane (Fig 2-2) if dirty.*

6. Clean the Chamber's inlet and outlet ports using pipe cleaners dipped in warm, soapy water. After cleaning, dry them with clean dry pipe cleaners.

7. Reassemble the chamber assembly as follows:

   NOTE: *DO NOT overtighten any screws; damage to plastic parts will result.*

a. If disassembled, push the Fan Assembly onto the Motor shaft until it seats (Fig 2-3). *Be sure the set screw* (Fig 2-3A) *is not screwed in so far that it prevents the adapter from seating fully*. Tighten the set screw to approximately 32–40 ounce-inches using the .05 in. Allen wrench. Spin the Fan Assembly to be sure it will run in the chamber.

b. Mate and secure the Chamber and Motor Assembly together with the two screws and nuts removed in Step 3 (Tighten to 16–20 oz. in.).

8. Reinstall the Membrane (mesh side toward the chamber assembly), O-ring, and Sensor on the chamber assembly (Fig 2-2); then secure the Sensor using the three screws and nuts removed in Step 2 (Tighten to 4–8 oz. in.).

9. Close the case as per Section "2.2 Closing the Case."

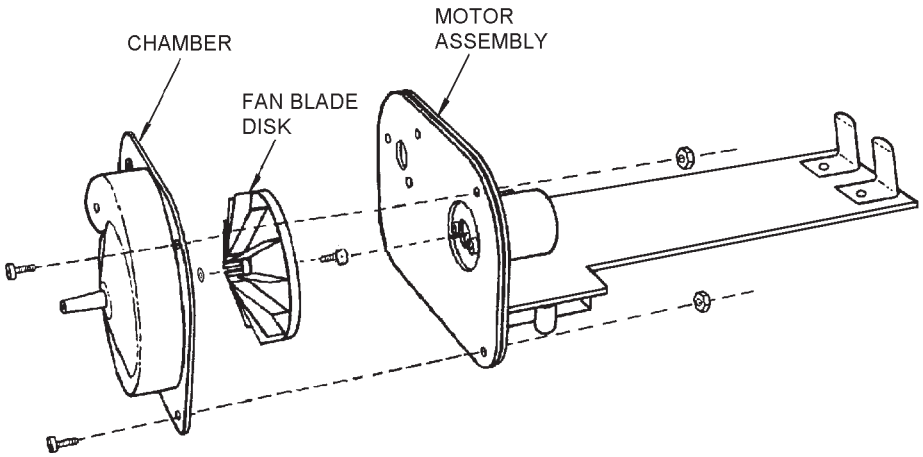


Figure 2-3. *Chamber Assembly, Exploded View*

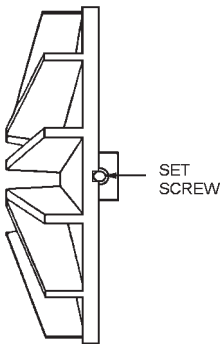


Figure 2-3A. *Fan-blade assembly set screw*

2.4 Sensor Replacement

When the instrument can no longer be spanned, as described in Section "3.0 Sensor Calibration," the Sensor has reached the end of its useful life, and should be replaced. The life of a Sensor is typically two years. The Sensor may also need to be replaced if the instrument will not zero properly, or if erratic gas readings occur. Refer to Section "4.0 Troubleshooting Chart."

Equipment Needed (Refer to Section "5.0 Replacement Parts" for Part Nos.):

- Phillips-head screwdriver, No. 1
- Nutdriver, 4mm (5/32")
- Screwdriver, 1/8" flat blade
- O-Ring and Membrane, if required
- Replacement Sensor:
- Dioxor II - SO_2
- Monoxor II - CO
- Nonoxor II - NO_X
- Monoxor II H - CO

Procedure:

WARNING!

Burn hazard! The Sensors contain corrosive chemicals, DO NOT puncture or take the sensors apart.

1. Open the case as described in Section "2.1 Opening the Case."

2. Using a nutdriver, loosen the nuts that secure the sensor wires to the Sensor terminals R, S and C; then remove the wires. If the Sensor has pin and socket connections, simply pull the sockets from the sensor pins.

3. Using a flat-blade screwdriver, remove the three screws and nuts that secure the Sensor to the chamber assembly; then remove the Sensor along with its O-ring and Membrane from the chamber assembly.

4. Remove and discard of the old Sensor in accordance with local and federal regulations. DO NOT discard the sensor's O-ring and Membrane, unless you intend to replace these items.

   NOTE: *Replace the O-ring if it looks deformed, and replace the Membrane if it is contaminated with oil or dirt. We recommend that both the O-ring and Membrane be replaced at the same time.*

5. Remove the new Sensor from its shipping canister. Do not remove the shorting wire (across the R & S terminals) from the Sensor (SO_2 & CO only, the NO_X does not have a shorting wire) until you are ready to make the electrical connection.

6. Position the Membrane, O-ring, and new Sensor on the chamber assembly as per Fig 2-2. Ensure that the sensor terminals are positioned as shown. Secure these items to the chamber assembly using the screws and nuts removed in Step 3 (Torque to 4–8 oz. in.). *DO NOT overtighten the screws!*

7. Remove the shorting wire from the R & S terminals (SO_2 & CO only). Connect the *blue* (S), *red* (R), and *black* (C) wires from the P.C.B. to their associated sensor terminals (See Fig 2-4). *If the Sensor uses nuts to secure the Sensor wires, DO NOT overtighten these connections!*

8. Close the case as per Section "2.2 Closing the Case."

9. Calibrate the new Sensor as per Section "3.0 Sensor Calibration."

2.5 Printed Circuit Board (P.C.B.) Replacement

Equipment Needed (Refer to Section "5.0 Replacement Parts" for Part Nos.):

- Phillips-head screwdriver, No. 1
- Printed Circuit Board (P.C.B.)

Procedure:

1. Open the case as described in Section "2.1 Opening the Case."

2. Unplug the motor connector from the P.C.B.

3. Unplug the sensor connector from the P.C.B.

   NOTE: *(For SO_2 & CO Sensors only) If the Sensor is not going to be immediately plugged into the new P.C.B., place a shorting wire between sensor terminals R and S.*

4. Remove the Switch Covers from the old P.C.B. and place them on the new P.C.B., then replace the old P.C.B. with the new one.

5. Plug the motor connector into the P.C.B.

6. Remove the shorting wire from sensor terminals R & S (if installed); then plug the sensor connector into the P.C.B.

7. Close the case as per Section 2.2 Closing the Case."

8. Calibrate the Sensor with the new P.C.B. as per Section "3.0 Sensor Calibration."

9. Discard the old P.C.B.

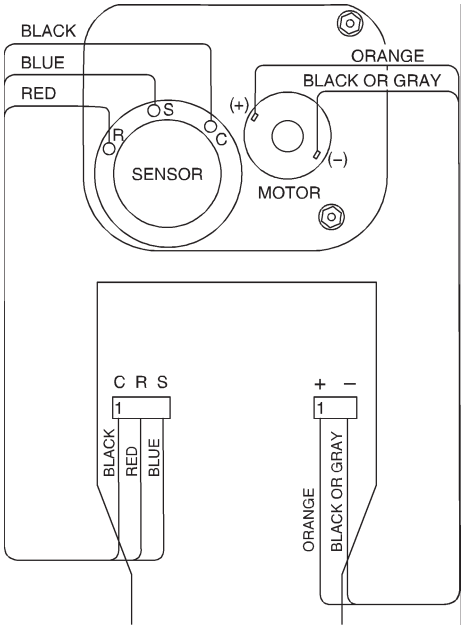


Figure 2-4.
Sensor & Motor Wiring Diagram

2.6 Chamber Assembly Servicing

To disassemble the chamber assembly, proceed as follows:

Equipment Needed (Refer to Section "5.0 Replacement Parts" for Part Nos.):

- Screwdriver, Phillips head, No. 1
- Screwdriver, 1/8" flat-blade
- Allen Wrench, .05 in.
- Replacement pump parts, as required

Procedure:

1. Open the case as described in Section "2.1 Opening the Case."

2. Using a flat-blade screwdriver, remove the three screws and nuts that secure the Sensor to the chamber assembly; DO NOT remove the sensor wires. Then remove the Sensor along with its O-ring and Membrane from the chamber assembly.

3. Using a No. 1 Phillips-head screwdriver, disassemble the Chamber from the Motor Assembly (Fig 2-3).

4. To remove the Fan Assembly, refer to Section 2.3, Step 4.

5. If Motor replacement is required:

   a. Unplug the motor connector from the circuit board and discard the Motor Assembly.

   b. Install a new Motor Assembly and connect the motor connector to the circuit board.

      NOTE: *A newly installed Motor must be broken in by running it for at least 30 minutes. A Motor not broken in may cause erratic display readings.*

6. Reassemble the chamber assembly with any replacement parts using Section 2.3, Step 7.

7. Reinstall the Membrane, O-ring, and Sensor using Section 2.3, Step 8.

8. Close the case as per Section "2.2 Closing the Case."

3.0 SENSOR CALIBRATION

3.1 Monoxor II CO Calibration

The following calibrates the MONOXOR II to a known concentration of carbon monoxide.

Equipment Needed (Refer to Section "5.0 Replacement Parts" for Part Nos.):

- Calibration Kit
- Carbon Monoxide Gas Cylinder, 500 ppm
- Potentiometer adjustment tool

Procedure:

WARNING!

Perform this procedure in a well ventilated area. CO is toxic!

1. Assemble the calibration equipment by connecting the Carbon Monoxide Gas Cylinder and the components of the Calibration Kit together as shown in Fig 3-1.

   NOTE: *DO NOT attach the calibration setup to the instrument at this time.*

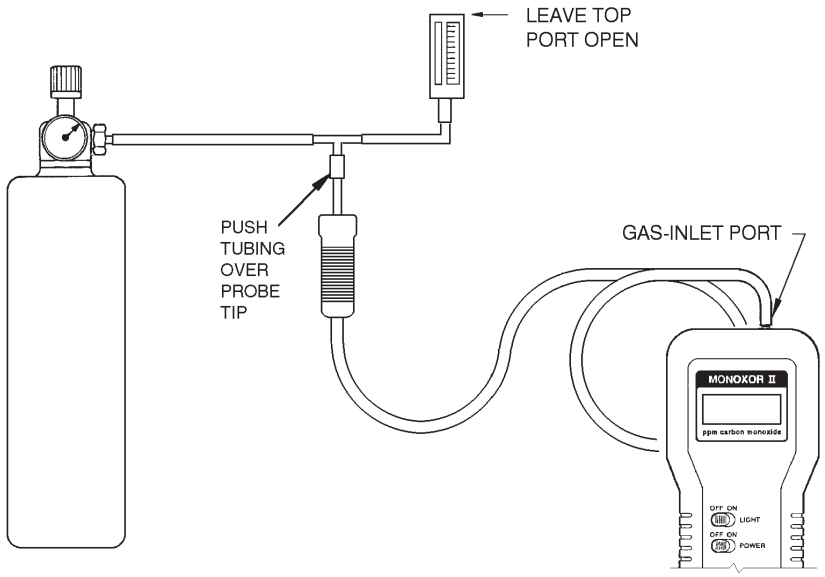
2. Zero the instrument as follows:

   a. Ensure instrument will be sampling CO-free (fresh) air in the following steps.

   NOTE: *An indication that the instrument was not zeroed in fresh air is when a large negative CO display appears when the instrument is moved into another area.*

   b. Set front panel POWER switch to ON.

Figure 3-1. *Calibration Kit Setup*



Important! *Do not proceed with this calibration procedure if the instrument's "LO BAT" indicator is on. We recommend that the instrument be calibrated with a fresh set of batteries.*

c. Wait until the instrument's CO display settles down (approximately 1 minute); then, using a potentiometer adjustment tool, turn the front panel ADJUST potentiometer (Fig 3-2) until the display shows 0 ±3 ppm. *The display shows negative numbers for zeroing purposes.*

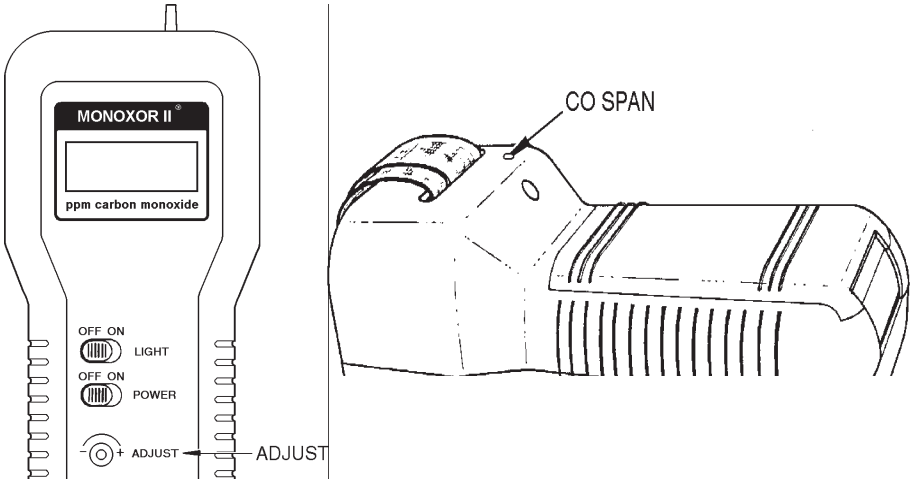


Figure 3-2. *ADJUST & CO Span Adjustments*

3. Connect the CO discharge hose of the calibration equipment to the Monoxor's probe tip; then open the CO cylinder regulator valve and adjust the regulator for a flowmeter indication of 1 to 2 SCFH.

4. Allow gas to flow for 2 minutes.

5. Read the detected CO level on the instrument's LCD. Then using a potentiometer adjustment tool, adjust the CO SPAN potentiometer until the LCD reading matches the gas cylinder's concentration value within ±5 ppm.

6. Shut off the regulator and remove the CO discharge hose from the gas inlet port. Then while observing the displayed CO level, allow the instrument to run until the CO reading drops to zero.

   NOTE: *If after 5 minutes the CO reading stabilizes at some value other than zero, readjust the ADJUST potentiometer for an LCD indica tion of ±3 ppm.*

7. Set front panel POWER switch to OFF.

8. Disassemble the calibration-equipment setup and store the components in the calibration kit's carrying case.

3.2 Dioxor SO_2, Monoxor II H CO, and Nonoxor NO_x Calibration

The presence of SO_2 and NO_X gas in small amounts, and CO gas in larger amounts, can be very toxic. Calibration at a Bacharach Sales/Service Center is recommended (See Section "5.4 Bacharach Sales/ Service Centers" to find the nearest center). If you have a facility that is properly equipped to handle toxic gas (i.e.. fume hoods, self contained breathing apparatus etc.), we would be glad to suggest a calibration method.

4.0 TROUBLESHOOTING CHART

Symptom	Cause	Remedy
No display when unit is switched on	Batteries dead	Replace batteries with four fresh “C” Alkaline cells.
	Batteries installed backwards	Insert batteries correctly. Wait at least one minute before switching on unit to allow its PTC resistor to cool.
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”
Backlight won't light	Backlight or its switch is defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”
Unit doesn't respond to gas (e.g., from calibration gas)	Sensor connections loose or broken	Check Sensor connections (Fig. 2-2).
	Sensor Membrane blocked with water or dirt	Remove Sensor and replace its Membrane. See Fig. 2-2.
	Sensor depleted or defective	Replace Sensor. Refer to Section “2.4 Sensor Replacement.”
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”
LCD segments missing	LCD loose or defective	Carefully re-seat LCD in its socket. If segments are still missing, replace LCD.
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”

Symptom	Cause	Remedy
Erratic display	Low batteries	Replace batteries with four fresh “C” Alkaline cells.
	Faulty Motor	Break in a new Motor for at 30 minutes.
		Replace Motor Assembly. Refer to Section “2.6 Chamber Assembly Servicing.”
	Sensor connections loose or broken	Check Sensor connections. See Fig 2-2.
	Sensor depleted or defective	Replace Sensor. Refer to Section “2.4 Sensor Replacement.”
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”
Unit won't zero and/or span	Too much gas present to zero	Move unit into an area known to be gas free.
	Probe kinked or blocked preventing gas flow	Unkink or Replace Probe.
	Sensor connections loose or broken	Check Sensor connections. See Fig 2-2.
	Sensor depleted or defective	Replace Sensor. Refer to Section “2.4 Sensor Replacement.”
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”

Symptom	Cause	Remedy
Bouncing display > ± 3 counts	Sensor connections loose	Check Sensor connections. See Fig 2-2.
	Motor has excessive arcing in its carbon brush/commutator interface causing RFI	Run Motor for at least 3 hours to wear away arc spots. If display still bounces, replace Motor Assembly. Refer to Section “2.6 Chamber Assembly Servicing.”
Very little (<0.25" H2O) or no draft indication on manometer dead headed into instrument	Chamber assembly screws loose	Tighten screws. Refer to Section “2.6 Chamber Assembly Servicing.”
	Fan-blade Assembly loose	Open chamber assembly and ensure that Fan-blade Assembly is mounted on Motor shaft. Refer to Section “2.6 Chamber Assembly Servicing.”
	Inlet and/or outlet port(s) blocked	Clean ports. Refer to Section “2.3 Cleaning.”
	Motor connections loose	Reconnect Motor leads. Refer to Section "2.6 Chamber Assembly Servicing."
	Motor defective	Check operation of Motor. If motor is receiving power but isn’t turning, replace Motor Assembly. Refer to Section “2.6 Chamber Assembly Servicing.”
	P.C.B. defective	Replace P.C.B. Refer to Section “2.5 Printed Circuit Board Replacement.”

5.0 REPLACEMENT PARTS

Replacement parts for the instrument are listed below. Please refer to the appropriate figure(s) for part locations.

5.1 Probe Assembly (Fig 5-1)

Item	Description	Part No.
1	Probe Assembly, Standard	0019-3076
--	Probe Assembly, Flexible (not shown)	0019-3104
2	Probe Tube	0019-3073
3	Probe Handle	0019-3017
4	Screw, Phillips head, M3 x .5 x 8 mm	0501-3806
5	Tubing, 5/16 OD X 3/16 ID	0003-6109
6	Filter Saturator Bushing	0011-0074
7	Filter Packing	0011-0121
8	Filter Tube	0011-0130
9	Front Ferrule	0003-2024
10	Rear Ferrule	0003-2025
11	Knurled Nut	0003-2023
12	Compression Fitting	0003-2021
13	Barbed Fitting	0003-6164
14	Extended Adapter Block	0019-3072
15	Connector Tube	0011-0070

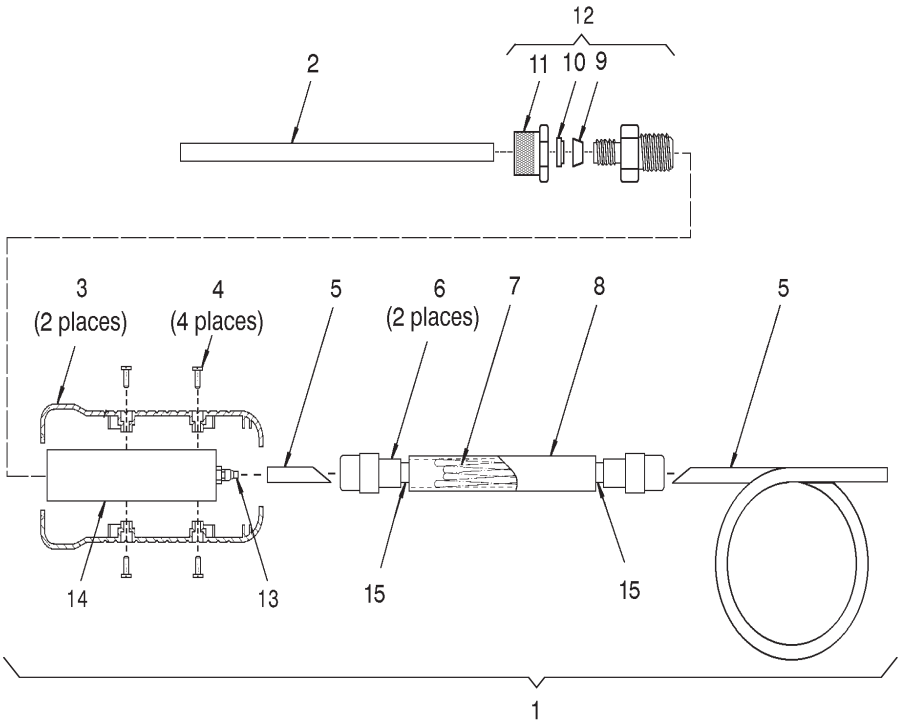


Figure 5-1. Standard Probe Assembly

5.2 Instrument Assembly (Figs 5-2 & 5-3)

Item	Description	Part No.
1	Adapter, Motor Shaft	0024-0412
2	Battery Clip, push on	0004-3113
3	Battery Cover with Foam Pad	0019-3029
4	Chamber	0019-3090
5	Front Cover w/Display Window (Dioxor II)	0019-3079
	Front Cover w/Display Window (Monoxor II)	0019-3055
	Front Cover w/Display Window (Nonoxor II)	0019-3078
	Front Cover (Monoxor II H) (order with 0019-0437)	0019-3014
	Display Window (Monoxor II H) (order with 0019-3014)	0019-0437
6	(Not Used)	
7	Fan-Blade Assembly	0019-3013
8	LCD	0004-3700
9	Motor Assembly	0019-3063
10	Nut, Hex M2 x .4	0502-0007
11	O-Ring and Membrane	0024-0520
12	Printed Circuit Board Assy. (Dioxor II)	0019-3022
	Printed Circuit Board Assy. (Monoxor II)	0019-3012
	Printed Circuit Board Assy. (Nonoxor II)	0019-3020
	Printed Circuit Board Assy. (Monoxor II H)	0019-3094
13	PTC Resistor	0204-9427
14	Rear Case w/ Label (Dioxor II)	0019-3082
	Rear Case w/ Label (Monoxor II)	0019-3053
	Rear Case w/ Label (Nonoxor II)	0019-3081
	Rear Case (Monoxor II H) (order with 51-2347)	0019-3008
	Label (Monoxor II H) (order with 0019-3008)	0051-2347
15	Retaining Ring	0002-2675
16	Screw, Cheese head, M2 x .4 x 30 mm	0501-3807
17	Screw, Phillips head, M2 x .4 x 6 mm	0501-3803
18	Screw, Phillips head, M3 x .5 x 8 mm	0501-3806
19	Sensor, SO_2 (Dioxor II)	0019-8002
	Sensor, CO (Monoxor II)	0024-0498
	Sensor, ,NO_X (Nonoxor II)	0019-8001
	Sensor, CO (Monoxor II H)	0019-8016
20	Set Screw, #4-40 x 1/8 LG	0002-0001
21	Strap	0019-3028
22	Strap Clip	0019-3030
23	Strap Retainer	0019-3027
24	Switch Cover	0019-3021

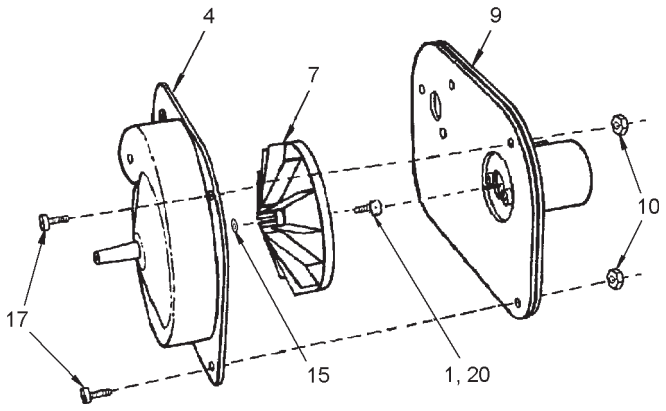
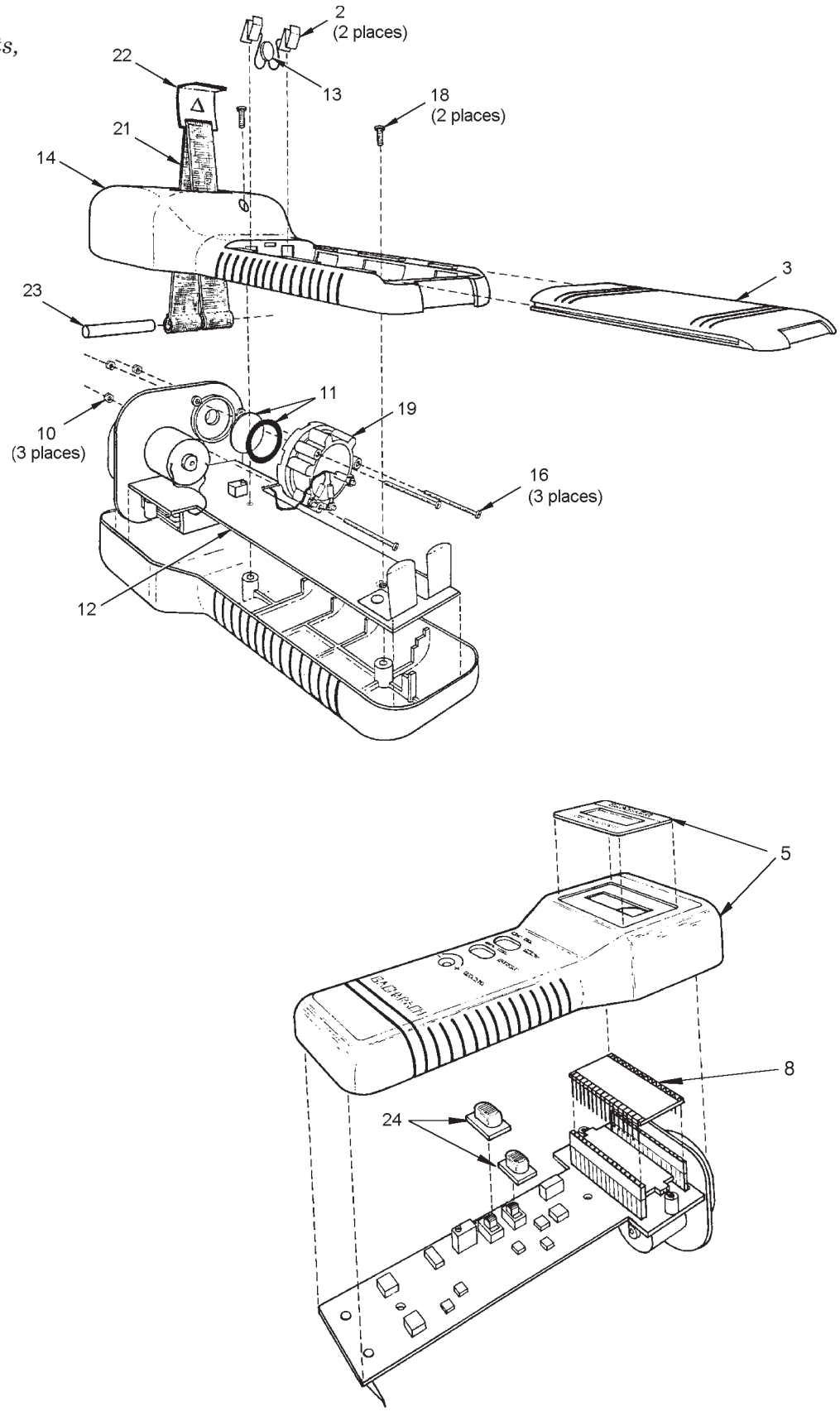


Figure 5-2. *Replacement Parts, Chamber Assembly Exploded View*

Figure 5-3.
Replacement Parts, Back and Front Exploded Views



5.3 Miscellaneous Parts and Accessories

Description	Part No.
Calibration Kit	0024-7059
Carbon Monoxide Gas Cylinder, 500 ppm	0024-0492
Potentiometer adjustment tool	0006-9456
Custom Carrying Case (1 Instrument)	0019-0377
Custom Carrying Case (2 Instrument)	0019-3040
Instruction Manual, (Dioxor II)	0019-9121
Instruction Manual, (Monoxor II)	0019-9113
Instruction Manual, (Nonoxor II)	0019-9120
Instruction Manual, (Monoxor II H)	0019-9180
Calibration Card	0019-9150
Service Manual, (This Manual)	0019-9166
Label, Carrying Case	0019-3077
Probe Stop (for Securing ¼ Probe in a Flue or Stack)	0024-0434
Warranty Card	0006-8825

5.4 BACHARACH Sales/Service Centers

United States

Bacharach, Inc.
621 Hunt Valley Circle
New Kensington, PA 15068
Phone: 724-334-5051
Fax: 724-334-5723
E-mail: help@mybacharach.com

Canada

Bacharach of Canada, Inc.
20 Amber St. Unit #7
Markham, Ontario L3R SP4
Canada
Phone: 905-470-8985
Fax: 905-470-8963
Email: bachcan@idirect.com